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2. A biannulate condition of the leech somite has probably preceded phylogenetically the triannulate condition; still earlier the somite was probably uniannulate, as in the chætopods. The simple uniannulate somite became biannulate by the separation of a narrow posterior ring from the rest of the somite; the triannulate condition was reached by the separation of a narrow ring at the anterior end of the somite, the sensillæ remaining on the middle ring.

These conclusions have been reached quite independently by Moore, who presents incontrovertible evidence in their support. He further expresses the opinion that the shorter somites commonly found at either end of the body of a leech are not, as they are usually regarded, "abbreviated" somites once multiannulate, but rather represent "stages of development arrested or in progress" from the uniannulate to the multiannulate condition.

The number of somites in the body of *Microbdella* is probably the same as in *Glossiphonia* (Clepsine) and *Herpobdella* (Nephelis), though Moore finds some evidence, not to his mind conclusive, of the existence of an additional somite at the anterior end of the body.

**Locomotion of *Solenomya*.** — *Solenomya* and its relatives show three methods of locomotion which have been studied by G. A. Drew.<sup>1</sup> The first is well represented in *Yoldia*. This clam possesses a spatula-like foot split into two plates at its distal end. The animal drives this foot into the mud, with the distal flaps held together. These are then expanded and serve as an anchor so that the contraction of the longitudinal muscles of the foot draws the animal through the mud to the place where the foot is anchored. There is no reason to suppose that these mollusks creep about on the expanded foot as snails do. The second method of locomotion, that of leaping, is seen in *Solenomya*, and especially in *Yoldia*. When the animal rests sidewise on a smooth surface, the foot is protruded and turned under the lower valve. If the foot is then suddenly contracted, the shell may be thrown end for end some inches. The third method of locomotion is that of swimming. This is accomplished by the vigorous ejection of water from the mantle cavity. The mantle lobes are united except at their anterior and posterior ends. By the separation of the valves, through the action of the elastic ligament, the mantle chamber is filled with water. The anterior opening is then closed by the foot, and by a vigorous

<sup>1</sup> Drew, G. A. Locomotion in *Solenomya* and its Relatives, *Anat. Anz.*, Bd. xvii, pp. 257-266, 1900.

contraction of the mantle musculature the water is expelled through the posterior opening, thus driving the body of the animal forwards. By a succession of such jets the animal may swim some feet before settling.

P.

**Ear Bones.**—The ear bones of vertebrates have undergone a careful comparative examination at the hands of J. S. Kingsley.<sup>1</sup> In urodeles and cecilians, where no tympanum exists, a stapes, which develops independently of the otic capsule, is the only element present. In the anura the space between the otic capsule and the tympanum is spanned by three elements, the stapes, the pseudoperculum, and the extracolumella, which collectively constitute the so-called columella of this group. It is important to observe that the intermediate piece, the pseudoperculum, is developed from the posterior wall of the tympanic cavity. In lizards the chain of ear bones consists of only two, the stapes and the extracolumella. Of the three ear bones in the pig the malleus is composed of three parts, a manubrium corresponding to the extracolumella of lower forms, a body representing the articulare, and a membrane bone forming at least a part of the *processus gracilis*. The stapes of the pig is homologous with the stapes of lower vertebrates. The incus which unites malleus and stapes cannot correspond to the pseudoperculum of lower vertebrates, because it develops from the anterior instead of the posterior wall of the tympanic cavity. As this position is that occupied by the quadrate, the incus is believed to be homologous with this bone. It will thus be seen that while the distal and proximal ends of the chain of ear bones in mammals and in lower vertebrates are homologous, the intermediate members are not, being the posterior pseudoperculum in amphibia and the anterior incus (quadrate) in mammals.

P.

**Otocysts of the Heteropods.**—Ilyin<sup>2</sup> has experimented upon *Carinaria* and *Pterotrachea* with the view of determining the physiological value of the otocysts in these mollusks. The otocysts are apparently stimulated not as auditory organs but as tactile organs. When both organs are removed, the animal is unable to keep itself correctly oriented and swims in circles. The presence or absence

<sup>1</sup> Kingsley, J. S. The Ossicula Auditus, *Tufts College Studies*, No. 6. (Scientific Series.) 1900.

<sup>2</sup> Ilyin, P. Das Gehörbläschen als Gleichgewichtsorgan bei den *Pterotracheidæ*, *Centralbl. f. Phys.*, Bd. xiii, pp. 691–694, 1900.